

REMARKS

The Office Action of April 28, 2004 presents the examination of claims 1-19 and 34-38. New claims 39 and 40 are added herein.

Support for new claims 39 and 40

New claim 39 is canceled claim 38 written in independent form. This method of amendment was chosen for editorial convenience.

New claim 40 is supported by the specification at, e.g. page 6, lines 2-3, which expressly states that the "use of protonic acids or organic solvents may be avoided."

Objections to the specification

The Examiner objects to the specification as not providing antecedent basis to the original claims 1 and 2. She finds no express statement of the terms, "irradiating the pre-doped composition with electromagnetic radiation thus producing an electrically conductive polymeric material, wherein the electromagnetic radiation is one or more of UV or near UV wavelengths."

The specification is so amended merely to advance prosecution of the application.

The Examiner might note that the specification, at page 3, lines 18-20, states that,

In the method of the present invention a polymeric material is rendered electrically conductive by treatment with a source of electromagnetic radiation, e.g. UV or near UV irradiation, in the presence of a viologen salt.

Furthermore, the specification Examples 2, 4 and 6 referred to by the Examiner expressly state that UV or near UV light is used as the electromagnetic radiation. Still further, the specification indicates at page 8, line 19 that a mercury vapor lamp is a useful source of UV or near UV light.

Applicants must admit that they do not understand the Examiner's comment that, "Ordinary room lighting could be of electrical origin, not necessarily UV or near UV." Light whether from ordinary room lights or from an ultraviolet source, is electromagnetic radiation. Whether light is deemed, "ordinary room light", "UV or near UV" is only a matter of the wavelength of the radiation.

The Liu Declaration

The Examiner finds the Liu Declaration insufficient to overcome the rejections of claims 1-19 and 34-37 made in the prior Office Action. (Applicants note, however, that the previous rejections have not been maintained.) The Examiner takes a position that the Liu Declaration does not provide a comparison of an embodiment of the invention with the closest prior art.

The Examiner misunderstands the purpose of the Liu Declaration. Dr. Liu's Declaration was made to provide evidence that forming the viologen salt *in situ* upon a substrate provides a much more conductive polymer compared to grafting an already formed viologen salt to the substrate. The Declaration was not intended to compare the instant process with that of the prior art. Applicants have argued that the Examiner has failed to establish *prima facie* obviousness of the invention, and therefore need not rely upon a comparative experiment showing unexpected results. A showing of unexpected results is not required to establish patentability until the Examiner succeeds in establishing *prima facie* obviousness of a claimed invention.

Dr. Liu's Declaration further establishes that achieving an electrically conductive polymer is not an inherent result of merely contacting a viologen with a polymeric material and exposing the composition to ultraviolet radiation. Rather, the particular processing steps utilized, e.g., whether the viologen is formed *in situ* upon a polymeric substrate or an already formed viologen is grafted to the polymer, can greatly influence the degree of conductivity achieved. The Examiner should compare the differences in conductivity achieved in the Examples 1, 2, 3 and 5 of the specification, where the viologen is formed in a different manner in each, and further note the extreme case of low conductivity

shown in Dr. Liu's further experiment, in which a previously formed viologen was grafted onto a polymeric substrate.

In this regard, Dr. Liu's Declaration is particularly relevant to patentability of claims 9 and 34-36 which state that the viologen is formed *in situ* and furthermore describe particular methods for such *in situ* formation.

Dr. Liu's Declaration also sheds light upon the difference between the invention and the Renbaum reference cited by the Examiner. In Renbaum's work, a polycationic crosslinked viologen was prepared from vinyl pyridine and dibromide, then grafted to a substrate with gamma radiation. On the other hand, claims 9 and 34-36 describe situations in which cross-linking of the viologen is minimized, with the result that much higher conductivity is achieved.

Rejections over prior art

Claims 1, 7-11, and 17 are rejected as being unpatentable over Mikhael '017 in view of Kato '762. Claim 2 is rejected as being unpatentable over Mikhael '017 in view of Kato '762 and IBM Technical Disclosure Bulletin. Claims 1-5, 7-11, 15, 17, and 18 are rejected as being unpatentable over Afzali-Ardakani '370 in view of Kato and IBM. Claim 6 is rejected over Afzali-Ardakani in view of Kato, IBM, and Beratan. Claims 12-16 are rejected over Mikhael in view of Kato, and Inata '062. Claims 12-16 are rejected

over Afzali-Ardakani in view of Kato, and Inata '062. Claims 19 and 35 are rejected over Afzali-Ardakani in view of Kato, IBM, Renbaum, and Spence '355. Claim 34 is rejected over Afzali-Ardakani in view of Kato, IBM, Spence, and Allemand '379. Claims 36 and 37 are rejected over Afzali-Ardakani in view of Kato, IBM, Beratan, Pohl '233, and Renbaum.

All of these rejections are respectfully traversed. Reconsideration and withdrawal thereof are requested. Applicants submit that the Examiner again fails to establish *prima facie* obviousness of the invention over the references.

Applicants have provided detailed description of the invention, and description of the Mikhael, Afzali-Ardakani, Renbaum, Spence, Allemand, Beratan, and Pohl references in their prior paper. Applicants have also distinguished the claimed invention from all of these references, together with the Porter reference, in their prior paper.

The present rejections are identical to those presented in the prior Office Action, except that the Kato reference has been substituted for the Porter reference, and in some instances the IBM Technical Disclosure Bulletin has been introduced.

The Examiner continues to cite the Mikhael and Afzali-Ardakani references as showing the making an electrically conductive material using a polymer substrate such as a polyaniline, pre-doping it with any sort of organic electron-accepting compound, and

irradiating it. Mikhael describes quinones as examples of organic electron-accepting compounds.

The Examiner now applies the Kato patent rather than the Porter reference to show the equivalence of quinones and viologens. However Kato, like Porter (which the Examiner now apparently agrees does not support a rejection of any claim), does not teach that quinones and viologens are equivalent in their ability to oxidize a polyaniline compound, or any other polymer, so as to make it conductive. Rather, Kato only describes photochromism and electrochromism of viologens in association with an electron donor such as polyvinyl pyrrolidinone.

Furthermore, there is no motivation to combine Kato with any of the other cited references since it does not discuss the conductivity of polyaniline. The Examiner should note that, in the experiments described by Kato, absorption maxima at 610 and 400 nm are observed when the composition is subjected to UV irradiation. These bands are due to reduction of dications of viologens to the corresponding radical cations by the radiation. On the other hand, as seen from Figure 2 of the instant specification, the absorption band at 615 nm due to polyaniline disappears and a new high intensity tail extending into the near-IR region (above 800 nm) is observed. This tail indicates change of the polyaniline from an insulating base state to the doped, conductive state.

Thus, Kato provides no suggestion whatsoever to make the present invention. Combination of Kato with either of Mikhael or Afzali-Ardakani does not disclose or suggest a polymer-viologen composition rendered conductive by irradiation. Therefore, Mikhael or Afzali-Ardakani cannot be combined with Kato to assert obviousness of the claimed invention, and any rejection based upon combination of Mikhael or Afzali-Ardakani with Kato should fail for this reason alone.

Second, Kato requires the use of acid and organic solvents which are expressly stated as unnecessary in the specification (see, page 7, lines 16-17). The Examiner should note the present claim 40, which recites that acids and organic solvents are not used, and also claim 19, which recites that no solvent is used. Plainly Kato teaches directly away from the invention embodied in these two claims and so any rejection including Kato cannot be properly applied to them.

All of the other rejections are based on the premise of the combination of Mikhael or Afzali-Ardakani with Kato. Since none of the additional references overcome the deficiencies of this combination, for the reasons explained in Applicants' prior paper, all of the presently standing rejections fail.

The Examiner has also added the IBM Technical Disclosure Bulletin as a new reference. This reference fails to remedy the deficiencies of any combination of Mikhael, Afzali-Ardakani and

Kato, and the additional references cited, to establish *prima facie* obviousness of the invention. The IBM Technical Disclosure merely teaches that viologen has an ultraviolet absorption band and that viologen changes color when exposed to ultraviolet light. Applicants assert that the rejections combining any of Mikhael, Afzali-Ardakani and the other references of record with the IBM Technical Disclosure Bulletin fail to establish *prima facie* obviousness of the invention for the same reasons combination of these papers with Kato fails.

No combination of references cited by the Examiner establishes *prima facie* obviousness of the claimed invention. Accordingly, all of the rejections under 35 USC § 103(a) should be withdrawn.

Obviousness-type double patenting

Claims 1-5 and 19 are rejected under the judicially-created doctrine of obviousness-type double patenting over claim 25 of copending application 09/828,924. Applicants note that the '924 application has been allowed. A Terminal Disclaimer is submitted herewith that is sufficient to overcome this rejection.

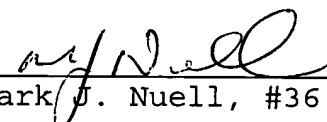
Applicants submit that the present application well-describes and claims patentable subject matter. Withdrawal of the standing rejections and allowance of the present claims is requested.

Should there be any outstanding matters that need to be resolved in the present application, the Examiner is respectfully requested to contact Mark J. Nuell (Reg. No. 36,623) at the telephone number of the undersigned below, to conduct an interview in an effort to expedite prosecution in connection with the present application.

If necessary, the Commissioner is hereby authorized in this, concurrent, and future replies, to charge payment or credit any overpayment to Deposit Account No. 02-2448 for any additional fees required under 37 C.F.R. § 1.16 or under 37 C.F.R. § 1.17; particularly, extension of time fees.

Respectfully submitted,

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Attachment: Terminal Disclaimer